

MEDIVATORS®

*ENDO*  
**stratus®**  
CO<sub>2</sub> Insufflator



**EGA-501 SERIES  
SERVICE MANUAL**

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## **Theory of Operation:**

The MEDIVATORS® ENDO STRATUS® CO<sub>2</sub> Insufflator works by regulating CO<sub>2</sub> from a tank source to a preset pressure and then controlling the output of CO<sub>2</sub> to a GI endoscope system for ultimate delivery as a distention media in the gastrointestinal tract. The clinician will use the air/water valve on the GI endoscope and visual feedback of the GI endoscopic system to manually distend the gastrointestinal tract with CO<sub>2</sub>.

The ENDO STRATUS CO<sub>2</sub> insufflator contains a CO<sub>2</sub> warming feature that allows the clinician to modulate and control delivery of CO<sub>2</sub> to the patient that has been warmed to a target temperature of 37°C with an upper tolerance of +3°C. Warming is achieved as CO<sub>2</sub> flows across a heating element which can be switched on or off by the user, depending on if warming of the CO<sub>2</sub> is desired. The heating of the CO<sub>2</sub> is accomplished through an internal 20W heating element with dual redundant temperature sensors.

The flow rate can be adjusted to low, medium or high settings depending on the desired rate of insufflation, with flow rates of 1.4 L/min, 2.4 L/min and 3.5 L/min maximum, respectively.

When the unit is turned on, the CO<sub>2</sub> flow and heating function are off by default. To initiate gas flow the user must turn the flow setting knob from the “off” position. The unit will detect gas flow and will not allow the heater to operate unless gas flow is detected. In addition, there is a low gas pressure sensor and the unit will indicate when the input CO<sub>2</sub> pressure reaches 25 PSI by illuminating a yellow light on the front panel.

The unit also has an output to power the water bottle warmer. The water bottle heating element maintains the temperature of the water in a sterile water bottle at 37°C ± 3°C. It is controlled by dual temperature sensors for redundancy and safety.

## **Definitions:**

- Throughout this document the MEDIVATORS® ENDO STRATUS® CO<sub>2</sub> Insufflator may be referred to as “unit”, “machine” or “device”
- mL/min – milliliters per minute (flow)
- VAC – Volts Alternating Current (electrical potential)
- kPa – kilo Pascal (pressure)
- W – Watts
- VA – Volt Amps

## **Indications for Use:**

The ENDO STRATUS CO<sub>2</sub> Insufflator is designed to use CO<sub>2</sub> as a distention media in the gastrointestinal tract when used in conjunction with a gastrointestinal endoscope.

The ENDO STRATUS CO<sub>2</sub> Insufflator contains a CO<sub>2</sub> warming feature that allows the clinician to modulate and control delivery of CO<sub>2</sub> to the patient that has been warmed to a target temperature 37°C.

## Contraindications:

The MEDIVATORS® ENDO STRATUS® CO<sub>2</sub> Insufflator should only be used by or under the direct guidance of a physician experienced in the standard practices of gastrointestinal endoscopy procedures. It should only be used for procedures where insufflation of the gastrointestinal tract is necessary to support navigation of the GI endoscope and performance of any necessary evaluation procedures. The device should not be used in any other method or for any other treatments or procedures.

The device is contraindicated for laparoscopic or hysteroscopic insufflation. It must not be used for intrauterine distension.

The device is contraindicated for CT colonography. Also, the device is not intended for use with or exposure to magnetic resonance imaging (MRI) systems. Do not use the device in an environment where it could be exposed to MRI systems.

## Warnings and Cautions

### Signal Words

**WARNING:** = Indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.

**CAUTION:** = Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

It may also be used to alert against unsafe practices or potential equipment damage.

### Safety Symbols



**Attention**



**Refer To Operating Instructions**



**Warning: Dangerous Voltage**



**Equipotentiality**



**DO NOT Allow Fingers to Contact Moving Parts**



**Hot Surface**



**MR Unsafe**

## **Warnings**

**To reduce risk of electrical shock, do not remove cover. Refer servicing to qualified service personnel.**

**To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth ground.**

**The ENDO STRATUS® CO<sub>2</sub> Insufflator is not suitable for use in the presence of a flammable anesthetic mixture with oxygen.**

**The ENDO STRATUS CO<sub>2</sub> Insufflator shall be sold only by prescription for use by physicians/clinicians who are trained regarding the amount of water to use for irrigation and infusion.**

**Only qualified medical personnel in an acceptable medical facility should operate the ENDO STRATUS CO<sub>2</sub> Insufflator.**

**The ENDO STRATUS CO<sub>2</sub> Insufflator should be connected to a properly grounded receptacle marked "Hospital Grade" or "Hospital Only," otherwise grounding reliability cannot be achieved.**

**Extreme precaution must be taken when handling liquids around electrical equipment. DO NOT operate the ENDO STRATUS CO<sub>2</sub> Insufflator if liquid has been spilled on the unit.**

**The ENDO STRATUS irrigation pump should not be used adjacent to or stacked with other equipment other than another ENDO STRATUS CO<sub>2</sub> Insufflator device. Electromagnetic or other interference may occur between the ENDO STRATUS CO<sub>2</sub> Insufflator and other electronic devices. If stacked or adjacent use is necessary, the equipment or system should be observed to verify normal operation in the configuration in which it will be used.**

**The ENDO STRATUS CO<sub>2</sub> Insufflator should only be used in conjunction with other equipment whose safety against leakage currents has been established.**

**The instructions contained in the operating manuals of any equipment to be used in conjunction with ENDO STRATUS CO<sub>2</sub> Insufflator must be followed to avoid any possible hazard from incompatibility.**

**The instructions for use described in this manual MUST be followed. Otherwise, compromised safety, malfunction, injury to the operator and/or patient, or costly damage to the unit and other equipment may occur.**

**The ENDO STRATUS® CO<sub>2</sub> Insufflator must be connected to an appropriate power source when loss of power source would result in an unacceptable risk.**

## **Caution**

If emergency or abnormal function occurs, immediately turn off the power to the unit.

Use only medical USP medical grade CO<sub>2</sub> from a “D” or “E” size CO<sub>2</sub> tank.

Read and understand all warnings that come with your commercially available “D” or “E” sized CO<sub>2</sub> tanks.

Field-servicing of the ENDO STRATUS CO<sub>2</sub> Insufflator is limited to the replacement of the power cords, water bottle holder and heater assemblies, pump heads, foot pedals and fuses.

Remove power from the device before initiating any field servicing of the replacement parts.

There are no user serviceable parts inside the ENDO STRATUS CO<sub>2</sub> Insufflator unit. Repairs to the ENDO STRATUS CO<sub>2</sub> Insufflator should only be performed by qualified service personnel.

When the low pressure warning indicator illuminates, exchange the CO<sub>2</sub> tank as soon as possible to avoid loss of function.

Always keep a spare full tank of CO<sub>2</sub> nearby for quick access.

Always keep the CO<sub>2</sub> tank in an upright position to avoid fluid entering the unit.

Do not use the device if the enclosure is damaged or enclosure integrity has been compromised.

Do not attempt to operate the device before reading and understanding all sections of this manual.

Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in “*EMC Tables*” Section.

Portable and mobile radio frequency (RF) communications equipment can affect medical electrical equipment.

Do not expose the device to sources of electromagnetic interference such as CT equipment, diathermy equipment, cellular phones, RFID tags and metal detectors.

# Product Features

## Features

- Internal CO<sub>2</sub> warmer eliminates cold CO<sub>2</sub>
- Built in water bottle warmer maintains water at up to 37°C with an allowable tolerance of ± 3°C
- Stackable with the ENDO STRATUS® Irrigation Pump
- Standard male luer lock output
- Uses standard “D” or “E” size CO<sub>2</sub> cylinders
- Accepts input from wall CO<sub>2</sub> with standard DISS type connection
- Usable at CO<sub>2</sub> input pressures lower than most comparable units, making efficient use of tank supply
- Works with disposable ENDO SMARTCAP® and ENDOGATOR® hybrid tubing for safety and compliance

## Safety Features

- Dual inline pressure regulators ensure a constant pressure
- Two additional mechanical pressure reliefs at ≤75 PSI and ≤12 PSI prevents overpressure
- Low CO<sub>2</sub> input pressure is indicated by a yellow light on the front panel
- On initial power up, gas flow is off until the flow knob is turned on
- CO<sub>2</sub> warmer will not operate unless flow is initiated

# Technical Specifications

## Electrical Specifications

Input Voltage:	100-240 VAC
Input Frequency:	50-60 Hz
Power Consumption	82 VA
Fuse Rating 	M10AL250V Medium acting, 10 amp, low breaking capacity, 250 volt Replace fuses only with those of same type and rating
Certifications	IEC-60601-1, IEC-60601-1-2, IEC-60601-2-18
Classification	Class 1 Type B
IP Rating (Ingress Protection)	IP24
Warning: 	<b>Grounding reliability can only be achieved when connected to a receptacle marked "Hospital Grade"</b>

## Mechanical Specifications

### Physical Dimensions:

#### Physical Dimensions:

Height	4-3/4 inches	121 mm
Width	7-3/4 inches	197 mm
Depth	13-3/4 inches	349 mm
Weight	10.5 pounds	4.8 kg

## CO<sub>2</sub> Specifications

<b>Free Flow rates (maximum unrestricted output to GI endoscope system):</b>	
<b>Front panel setting</b>	
Low	1.4 L/min
Medium	2.4 L/min
High	3.5 L/min
<b>GI endoscope Flow Rates (approximate flow rate at GI endoscope output):</b>	
<b>Front panel setting</b>	
Low	0.6 – 0.9 L/min*
Medium	1.2 – 1.4 L/min*
High	1.5 – 1.8 L/min*

*\*These values are approximate and are based on testing with respective models of GI endoscopes. User results may vary depending on GI endoscope used, channel diameter, and channel length.*

Output Connection:	Male luer lock
Input Connection	1/4" male flare fitting
CO <sub>2</sub> Heater	20W, internal, flow through, with dual redundant temperature sensors.
CO <sub>2</sub> Output Temperature	37°C (+3°C)
Operating Pressure	Input pressure 850 PSI Maximum, 25 PSI Minimum*

*\*The low pressure warning light will illuminate at 25 PSI, although the unit may still flow. It is recommended to replenish the CO<sub>2</sub> supply when the light illuminates.*

Pressure regulator set point	8 PSI Maximum
Internal safety relief valves	≤ 75 PSI and ≤ 12 PSI

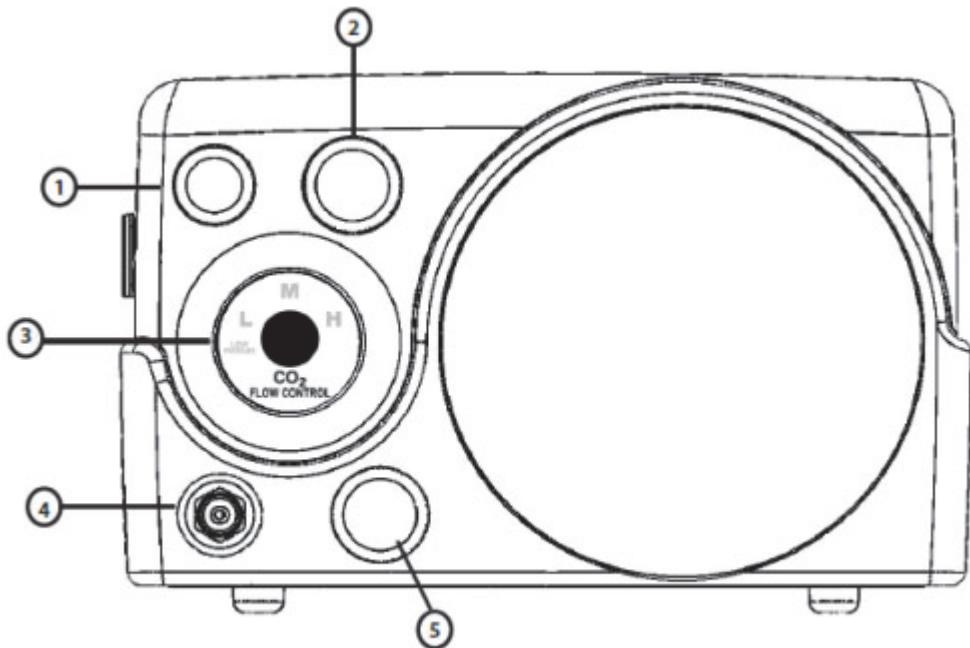
## **Environmental requirements:**

Operating Temperature	16° to 24°C (+61° to 75°F)
Operating Relative Humidity	30% to 75% non-condensing
Operating Pressure	70 kPa – 106 kPa (10.2 PSI – 15.4 PSI)
Storage Temperature	0° – 40°C (32° to 104°F)
Storage Relative Humidity	10% to 95% non-condensing
Storage Pressure	70 kPa – 106 kPa (10.2 PSI – 15.4 PSI)

# Controls and Connections

## Front Panel

 Note: All status indicator lights will be green during normal operation.



*(The appearance of your device may differ slightly from picture shown above)*

### 1. On/Off push button

Turns main power on or off to the unit

### 2. Water warmer On/Off

Push to turn water warmer on or off

### 3. CO<sub>2</sub> Flow control

Controls flow rate of CO<sub>2</sub> output. The three levels are represented by three green indicators of "L", "M", and "H" which are illuminated to indicate the flow rate setting. The flow rates are as follows\*:

- Low – 1.4L/min
- Medium – 2.4L/min
- High – 3.5L/min

*\*Flow rates shown are maximum free flow measurements at output of unit*

Low gas pressure is indicated by the words "LOW PRESSURE" flashing to notify the user that the gas input pressure has fallen below 25PSI.

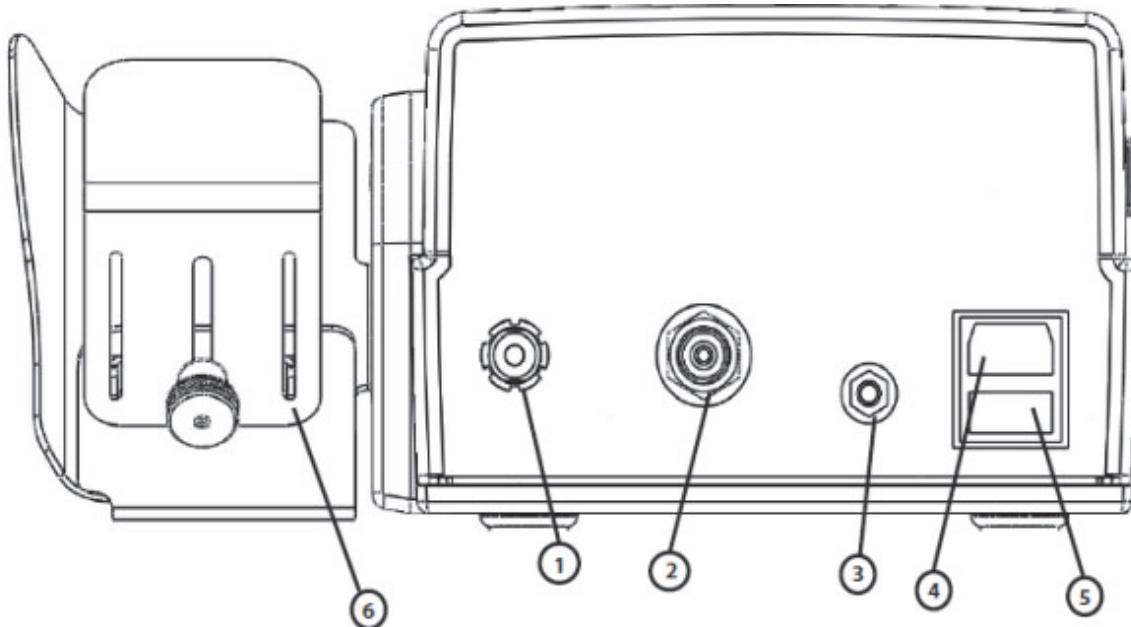
### 4. CO<sub>2</sub> gas output connector

Connect to tubing and GI endoscope. Standard male luer lock connector.

### 5. CO<sub>2</sub> gas heater On/Off

Push to toggle CO<sub>2</sub> gas heater On or Off

## Rear Panel Connections



*(The appearance of your device may differ slightly from picture shown above)*

### 1. Water Bottle Warmer connection

Power connection for water bottle warmer

### 2. CO<sub>2</sub> input connection

For connecting a "D" or "E" sized CO<sub>2</sub> tank. Use only pre-filtered medical grade CO<sub>2</sub> gas.

### 3. Equipotentiality (Earth Ground)

### 4. AC power connection

AC power input 100-240 VAC, 50-60HZ



**WARNING:** Use only the hospital grade power line cord supplied with this unit. Connect only to a power receptacle marked as hospital grade.

### 5. Fuse Receptacle

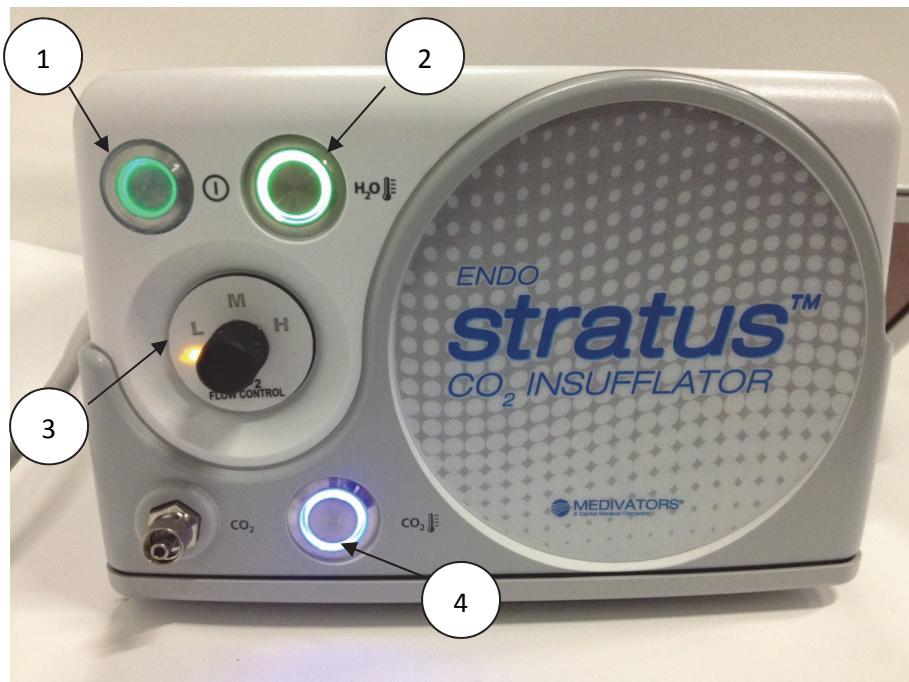


**WARNING:** Replace only with type and rating marked M10AL250V

## 6. Water Bottle Holder and Warmer

The water bottle holder contains the warming system for the water bottle and connects to the MEDIVATORS® ENDO STRATUS® CO<sub>2</sub> Insufflator by means of an electrical cable which plugs into the receptacle marked "Water Warmer".

## Description of indicator lights on front panel



### 1. POWER SWITCH

**NOT ILLUMINATED** – Main power is turned OFF  
**ILLUMINATED GREEN** – Main power is turned ON

### 2. WATER HEATER - POWER SWITCH

**NOT ILLUMINATED** – Water Heater Power switch is OFF  
**ILLUMINATED GREEN** – Water Heater Power switch is ON  
**ILLUMINATED FLASHING BLUE** - Indicates an Error: Water heater temperature sensor is detecting an over temp condition or the heater cable is disconnected from the back of the insufflator.

### 3. CO<sub>2</sub> FLOW CONTROL SWITCH

**NOT ILLUMINATED** – Switch set below the L (Low position)  
**ILLUMINATED L, M or H** - Insufflator is powered on and L (low), M (Medium) or H (High) has been selected.

**FLASHING ILLUMINATED LOW PRESSURE** – Supply CO<sub>2</sub> pressure is too low (<25 PSI) or turned off)

#### 4. CO<sub>2</sub> HEATER SWITCH

**NOT ILLUMINATED** – CO<sub>2</sub> heater is turned OFF

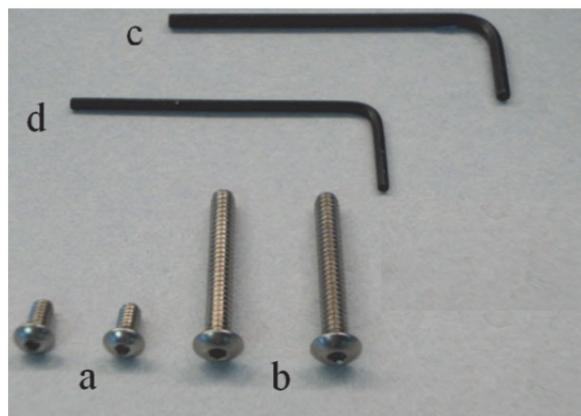
**ILLUMINATED GREEN** – CO<sub>2</sub> heater is turned ON

**ILLUMINATED BLUE** -Error: CO<sub>2</sub> is detecting an over temp condition or a low CO<sub>2</sub> pressure has been detected and the heater has been deactivated.

## Setup and Operation

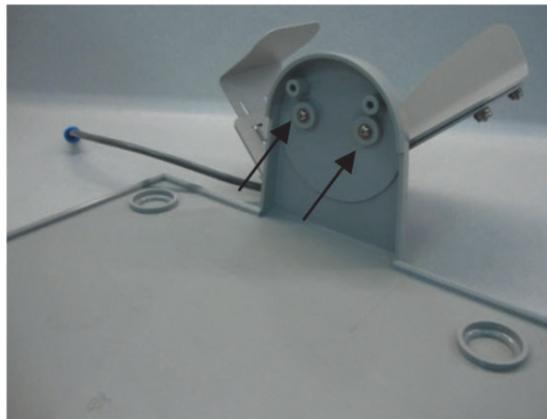
### Initial Setup

1. Place the MEDIVATORS® ENDO STRATUS® CO<sub>2</sub> Insufflator on a flat surface such as an accessory cart or other suitable working surface.
2. Before beginning, inspect the ENDO STRATUS CO<sub>2</sub> insufflator for any signs of damage.
3. Connect the power cord to the back of the device.
4. Before connecting the power cord to the hospital grade wall receptacle, make sure the power is OFF, and no accessories are connected. Then plug the power cord into the wall receptacle.
5. Assemble the water bottle holder and warmer assembly in the following manner:
  - A. The following supplies are necessary and can be found in a bag attached to the water bottle holder (see figure 1):
    - a - Short Screws (2)
    - b - Long Screws (2)
    - c - Large Hex Key
    - d - Small Hex Key



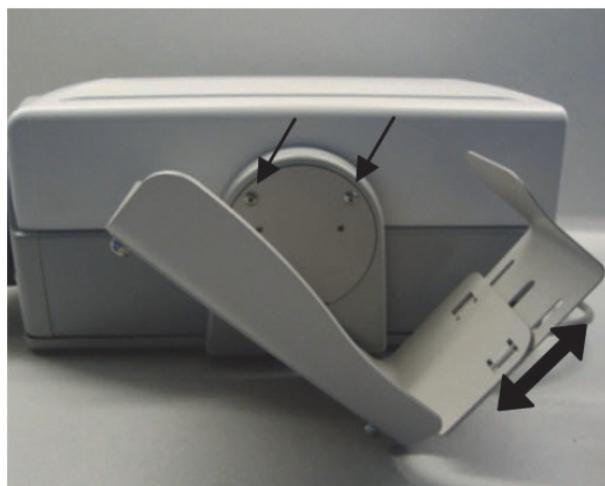
**Figure 1**

- B. Attach the water bottle holder to the base tray using the (2) small screws and small hex key. See figure 2.



**Figure 2**

- C. Place the ENDO STRATUS® CO<sub>2</sub> Insufflator on the base tray and install the (2) long screws using the large hex key. See figure 3.



**Figure 3**

- D. Adjust the water bottle hold-down bracket to fit the water bottles used by your facility. This is done by loosening the nut on the back and sliding the bracket up or down so it contacts the water bottle and then re-tightening the nut.
- 6. Plug the water warmer cable into the receptacle marked "Water Warmer" on the back of the unit.

## **CO<sub>2</sub> hose attachment**

### **Tools required:**

- 9/16" open-end wrench
- 3/4" open-end wrench

### **Accessories required:**

"D" or "E" size CO<sub>2</sub> tank filled with medical grade CO<sub>2</sub> (not included)

High pressure hose

Yoke adapter

1. Assemble the high pressure hose and the yoke by tightening the hose with the 3/4" wrench while holding the yoke with the 9/16" open-end wrench.
2. Unscrew the T-handle on the yoke to allow it to slip over the top post of the CO<sub>2</sub> tank. The correct orientation is so that the two pins on the yoke line up with the two alignment holes on the tank. (CO<sub>2</sub> tank is not included with system, purchase separately)
3. After aligning the two pins, tighten the T-handle firmly.
4. Tighten the other end of the high pressure hose and yoke assembly to the back of the ENDO STRATUS<sup>®</sup> CO<sub>2</sub> Insufflator. Hold the brass fitting with wrench and use a second wrench to tighten the hose nut. DO NOT USE TEFLON TAPE OR THREAD SEALANT ON THE FITTINGS.

### **Pre-Procedure setup**

1. Open the valve on the CO<sub>2</sub> tank approximately 1 turn.
2. Turn the power switch to "On"
3. Test the setup by turning the flow control knob position clockwise. Verify that there is CO<sub>2</sub> flowing out the front output of the unit. If there is no CO<sub>2</sub> observed out the front of the unit verify that the CO<sub>2</sub> tank is full and check the connection outlined in CO<sub>2</sub> hose attachment above.
4. Turn off the flow control knob.
5. Connect the tubing to the front output of the device. Use only ENDO SMARTCAP<sup>®</sup> tubing or ENDOGATOR<sup>®</sup> hybrid tubing manufactured by MEDIVATORS.

- When using ENDO SMARTCAP™ CO<sub>2</sub> source tubing, attach ENDO SMARTCAP source tubing to ENDO SMARTCAP® tubing or ENDOGATOR® hybrid tube set. Attach ENDO SMARTCAP tubing or ENDOGATOR hybrid tube set to the GI endoscope according to the manufacturer's instructions.

## Water Pre-Warming

- The ENDO STRATUS® CO<sub>2</sub> Insufflator can be used to control the Water Bottle Warmer system. The warmer system can maintain the temperature of bottles of sterile water at 37°C (±3°C). However, the system is not intended to raise the temperature of the water; therefore, pre-warming of the water bottle is required.
- The water bottle must be pre-warmed with a method such as a fluid warmer if warm water is desired. Water bottle pre-warming should be performed according to the following instructions:

**Place sterile water bottle in a fluid warming oven set to 37°C ± 3°C. Do not exceed this temperature. If warm water is not desired, turn the water warmer on the pump off and place a bottle of room temperature sterile water on the water bottle holder.**

 **NOTE:** If the water warmer has been enabled and has exceeded the upper temperature set point limit, the water warmer's switch indicator light will turn blue and the warmer will automatically shut off. If the switch indicator light is flashing blue, ensure the Water Warmer Cable is plugged into the back of the unit. If it is connected and the light is flashing, this may indicate a problem with the unit. Contact MEDIVATORS Technical Support at 800-444-4729.



**Read and become familiar with all manufacturers' instructions on warming ovens and water bottles regarding maximum fluid temperatures. Never exceed 40°C during water pre-warming. Never use a microwave oven to warm a water bottle, as this could heat the water to a dangerously high temperature or could result in uneven warming.**



**CAUTION:** The surface of the Water Bottle Warmer may be hot to the touch.

## **Operation**

1. After the pre-procedure setup has been completed, flow can be initiated.
2. Turn the Flow Control Knob to the first position. "L" will illuminate for "LOW". If a higher flow rate is desired, turn the knob to the next position for "MEDIUM" and one more position for "HIGH". "M" will illuminate for "MEDIUM" and "H" will illuminate for "HIGH". The knob will turn freely in each direction, and will increase or decrease the flow rate accordingly.
3. If warming of the CO<sub>2</sub> is desired, press the button for the CO<sub>2</sub> heater. The button will illuminate green.
4. If the device is attached to a water bottle warmer, and water warming is desired, press the button for Water Bottle Warmer. The button will illuminate green.
5. Use the appropriate air/water valve on the GI endoscope and visual feedback of the GI endoscopic system to manually distend the gastrointestinal tract with CO<sub>2</sub>.

## **Shutdown**

1. When the procedure is over, turn the Flow Control Knob counter clockwise until all lights are off, turn off the Water Bottle Warmer (if attached) and turn off the CO<sub>2</sub> heater.
2. Turn off the Main Power Switch and disconnect the tubing from the front of the unit.
3. Discard the tubing according to the manufacturer's instructions for proper disposal.

## **Care and Maintenance**

### **Cleaning**

- Before cleaning ensure the power to the unit is turned off and the electrical cord unplugged.
- The outside surface of the unit can be cleaned with a damp cloth, 70% isopropyl alcohol solution, or a 10% bleach with water solution as often as deemed necessary.
- To disinfect the outside surface, use a mild disinfectant as needed according to the manufacturer's instructions.
- Do not use abrasive or harsh cleaners.
- Do not allow liquid to enter the unit.
- Do not sterilize the unit by any means.

# Electromagnetic Compatibility (EMC) Information

## EMC Tables

**Table 1 – Guidance And MANUFACTURER'S Declaration  
ELECTROMAGNETIC EMISSIONS  
For All ME EQUIPMENT And ME SYSTEMS**

Guidance and Manufacturer's Declaration – Electromagnetic Emissions		
The EGA-501/EGA-501E is intended for use in the electromagnetic environment specified below. The customer or user of the EGA-501/EGA-501E should ensure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic Environment-Guidance
RF Emissions CISPR 11	Group 1	The EGA-501/EGA-501E uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class A	The EGA-501/EGA-501E is suitable for use in all establishments, <b>other than</b> domestic, and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonics IEC 61000-3-2	Class A	
Flicker IEC 61000-3-3	Complies	

**Table 2 – Guidance And MANUFACTURER'S Declaration**  
**Electromagnetic IMMUNITY**  
**For All ME EQUIPMENT And ME SYSTEMS**

Guidance and Manufacturer's Declaration – Electromagnetic Immunity			
<b>The EGA-501/EGA-501E is intended for use in the electromagnetic environment specified below. The customer or user of the EGA-501/EGA-501E should ensure that it is used in such an environment.</b>			
Immunity Test	EN/IEC 60601	Compliance Level	Electromagnetic Environment – Guidance
ESD EN/IEC 61000-4-2	±6kV Contact ±8kV Air	±6kV Contact ±8kV Air	Floors should be wood, concrete or ceramic tile. If floors are synthetic, the r/h should be at least 30%
EFT EN/IEC 61000-4-4	±2kV Mains ±1kV I/Os	±2kV Mains ±1kV I/Os	Mains power quality should be that of a typical commercial or hospital environment.
Surge EN/IEC 61000-4-5	±1kV Differential ±2kV Common	±1kV Differential ±2kV Common	Mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips/ Dropout EN/IEC 61000-4-11	>95% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25 Cycles >95% Dip for 5 Seconds	100% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25 Cycles  Note 1	Mains power quality should be that of a typical commercial or hospital environment. If the user of the EGA-501/EGA-501E requires continued operation during power mains interruptions, it is recommended that the EGA-501/EGA-501E be powered from an uninterruptible power supply or battery.
Power Frequency 50/60Hz Magnetic Field EN/IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be that of a typical commercial or hospital environment.

Note 1 The EUT shuts off and must be manually restarted by the operator during a 5 second loss of AC Mains power.

**Table 4 – Guidance And MANUFACTURER'S Declaration**  
**Electromagnetic IMMUNITY**  
**For ME EQUIPMENT And ME SYSTEMS That Are Not LIFE-SUPPORTING**  
**Guidance and manufacturer's declaration – electromagnetic immunity**

<p><b>The EGA-501/EGA-501E is intended for use in the electromagnetic environment specified below. The customer or user of the EGA-501/EGA-501E should ensure that it is used in such an environment.</b></p>			
Immunity Test	EN/IEC 60601 Test Level	Compliance Level	Electromagnetic Environment – Guidance
Conducted RF EN/IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	(3)Vrms	Portable and mobile communications equipment should be separated from the EGA-501/EGA-501E by no less than the distances calculated/listed below: $D=(3.5/V1)(\text{Sqrt } P)$ $D=(3.5/E1)(\text{Sqrt } P)$ 80 to 800 MHz
Radiated RF EN/IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	(3)V/m	$D=(7/E1)(\text{Sqrt } P)$ 800 MHz to 2.5 GHz  Where P is the max power in watts and D is the recommended separation distance in meters.  Field strengths from fixed transmitters, as determined by an electromagnetic site survey, should be less than the compliance levels (V1 and E1).  Interference may occur in the vicinity of equipment containing a transmitter.

**Table 6 – Recommended Separation Distances Between Portable And Mobile RF Communications Equipment And The EGA-501/EGA-501E EQUIPMENT and SYSTEMS That Are Not LIFE-SUPPORTING**

Recommended Separations Distances for the EGA-501/EGA-501E			
Max Output Power (Watts)	Separation (m) 150kHz to 80MHz $D=(3.5/V1)(\text{Sqrt } P)$	Separation (m) 80 to 800MHz $D=(3.5/E1)(\text{Sqrt } P)$	Separation (m) 800MHz to 2.5GHz $D=(7/E1)(\text{Sqrt } P)$
0.01	.1166	.1166	.2333
0.1	.3689	.3689	.7378
1	1.1666	1.1666	2.3333
10	3.6893	3.6893	7.3786
100	11.6666	11.6666	23.333

## Cover Removal

- Tools Required:
- 5/64" hex Wrench
- Phillips Screwdriver

## Procedure

1. Disconnect power cord to the Insufflator.
2. Disconnect the Water Warmer cable from the rear of the machine.
3. Remove Water Bottle Warmer by removing the retaining screws (4). Refer to figure 1.
4. Remove the screws (2) and Water Bottle Hanger Bracket from the left side of the unit. Refer to figure 2.
5. Lift the Insufflator from the pump tray. See figure 3.
6. Remove the cover screws (1 each side). See figure 4.
7. Lift the Cover from the Insufflator. Refer to figure 5.



Figure 1



Figure 2



**Figure 3**

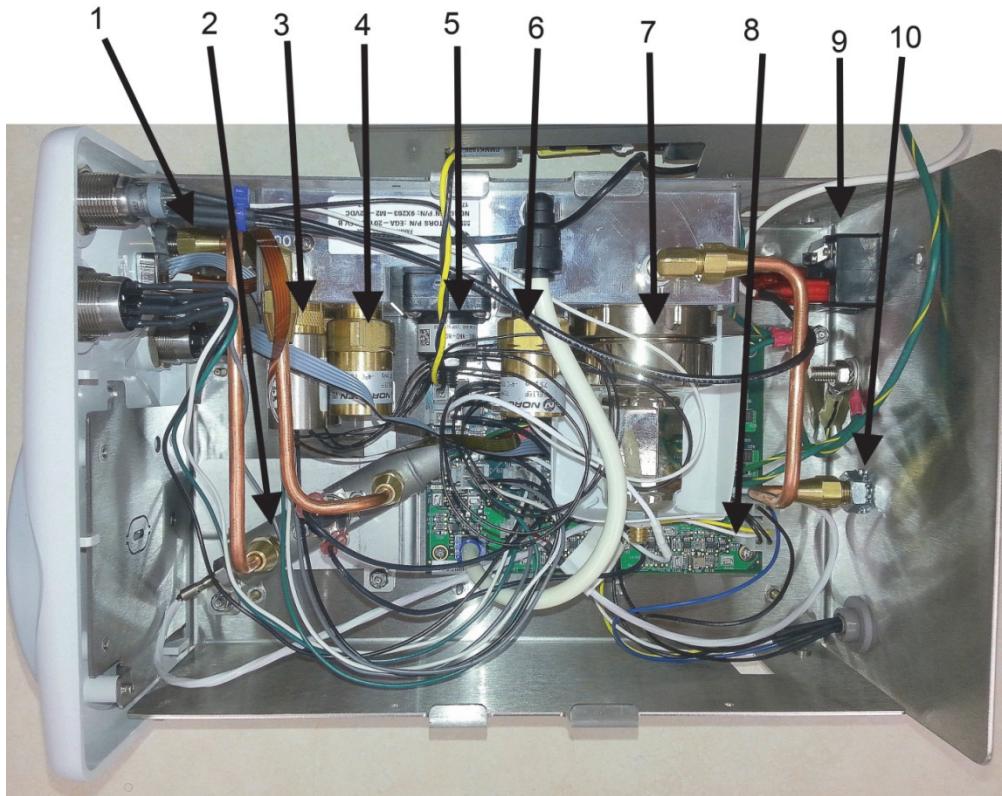


**Figure 4**



**Figure 5**

## Insufflator Components



## Internal Components

1. CO<sub>2</sub> Outlet
2. CO<sub>2</sub> Heater
3. Flow Valves
4. 12 psi Pressure Relief Valve
5. 8 psi Low Pressure Regulator
6. 75 psi Pressure Relief Valve
7. 50 psi High Pressure Regulator
8. Control Board
9. Power Entry Module
10. CO<sub>2</sub> Inlet

 Note: Components 3 through 7 are part of the Manifold Assembly and are not orderable separately.

# Power Supply

## Description

The Insufflator Power Supply is a 150 watt medical grade power supply that is capable of operating at input voltages from 100 VAC to 240 VAC. The Power Supply outputs 24 VDC to the Control Board. It has an indicator LED that indicates proper operation.



Wire	Power Supply Terminal
1. Ground (Green and yellow)	Ground
2. Neutral (white)	ACN
3. Hot (100 VAC to 240 VAC) (Black)	ACL
4. Ground DC (Black)	COM (Note location in figure 2)
5. +24 VDC (Yellow)	+V (Note location in figure 2)
6. Indicator LED	N/A

# Control Board

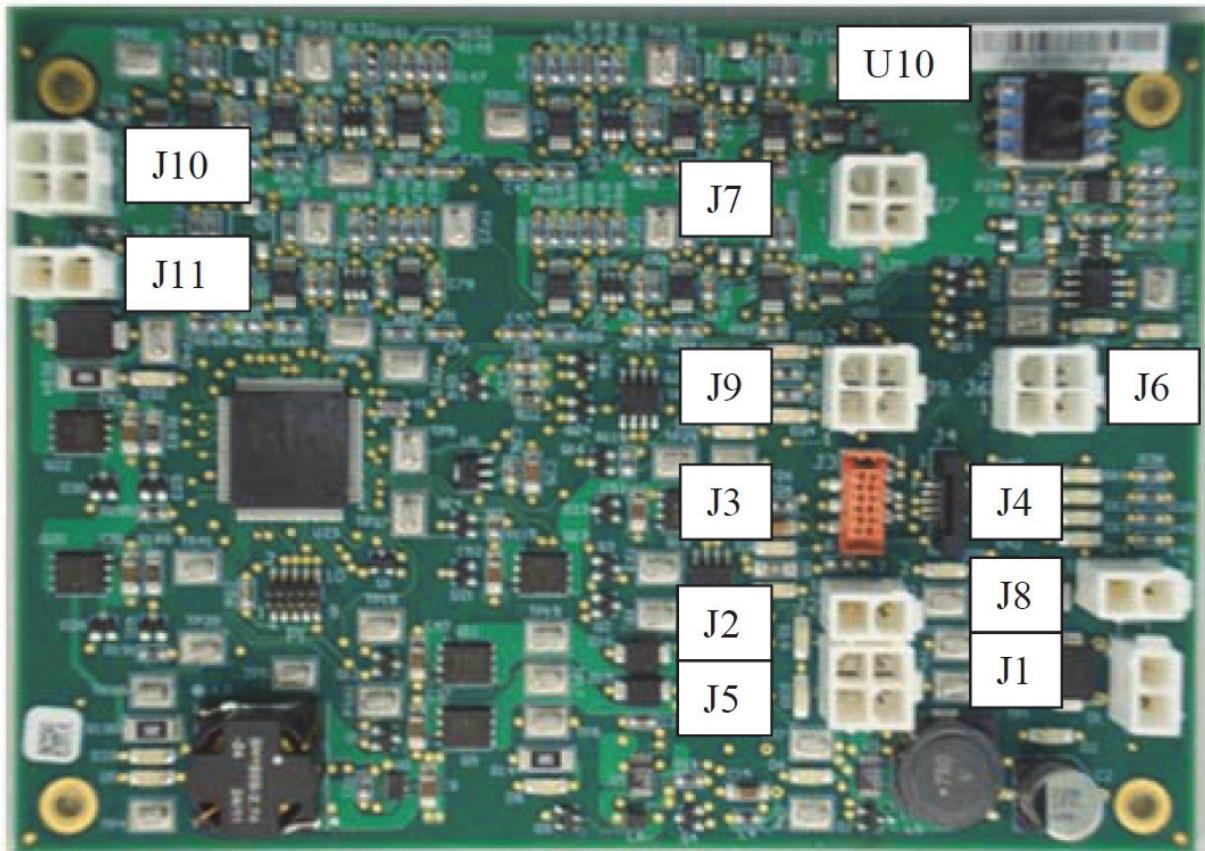


Figure 1

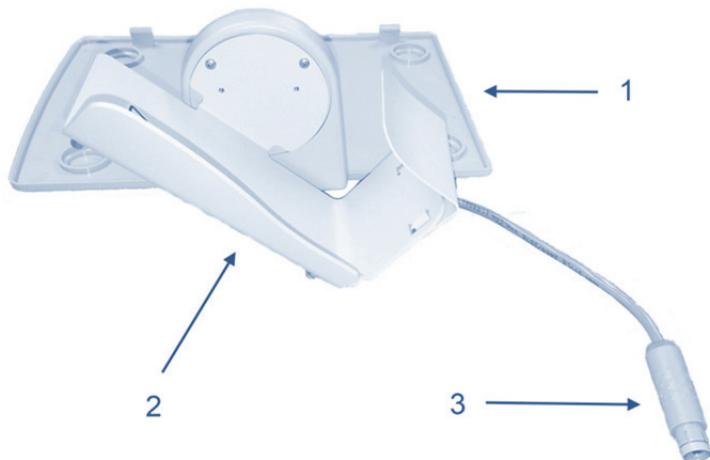
## Connection

J1 (2 pins)  
J2 (2 pins)  
J3 (ribbon cable)  
J4 (ribbon cable)  
J5 (4 pins)  
J6 (4 pins)  
J7 (4 pins)  
J8 (2 pins)  
J9 (4 pins)  
J10 (4 pins)  
J11 (2 pins)  
U10 Pressure Sensor

## Description

+24 VDC Cable from the Power Supply  
Power Switch LED (front panel)  
CO<sub>2</sub> Flow Control Switch (front panel)  
CO<sub>2</sub> Flow Control LED Ribbon Cable  
CO<sub>2</sub> Flow Valves (manifold)  
CO<sub>2</sub> Heater Switch (front panel)  
CO<sub>2</sub> Temperature Sensor  
CO<sub>2</sub> Heater  
H<sub>2</sub>O Switch (front panel)  
H<sub>2</sub>O Temp Sensors (Water Warmer connection)  
H<sub>2</sub>O Heater (Water Warmer connection)  
Board mounted pressure transducer

## Pump Tray and Water Bottle Warmer



1. Tray
2. Water Bottle Warmer Assembly
3. Water Bottle Warmer Cable

# Troubleshooting

## Unit will not power on

*(Perform the steps below in the specified order)*

### Tools Required:

- Digital Multi Meter (DMM)
- Phillips screwdriver



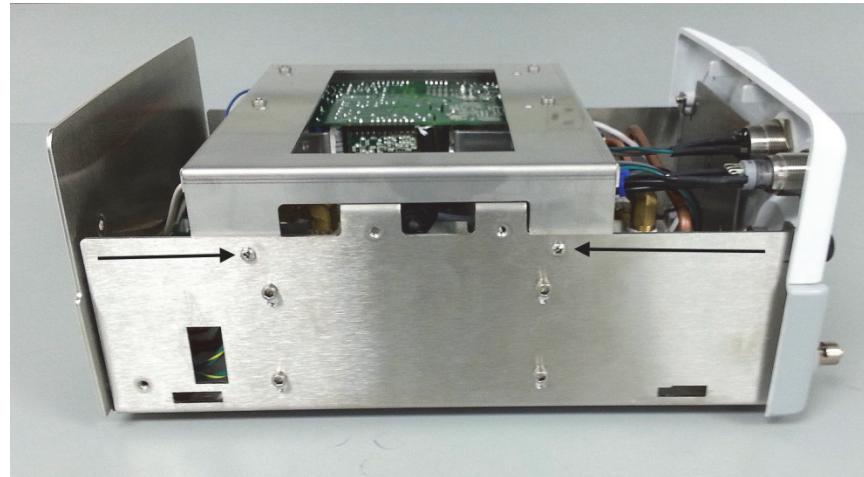
Note: Disconnect the power cord from the wall outlet before completing the following steps.

1. Remove the cover as outlined in “Cover Removal” Section.
2. Verify that the Power Switch on the front of the machine was fully depressed causing it to latch on. If the switch does not remain latched once it is fully depressed replace the Power Switch.
3. Verify all wires are securely connected at the Power Supply, Control Board and Power Entry Module.
4. Verify appropriate voltage at the wall outlet.
5. Verify the fuse is functional. The fuse is located in the Power Entry Module on the back of the unit. See figure 1. Remove the fuse and test resistance with a digital multimeter. Replace if necessary.



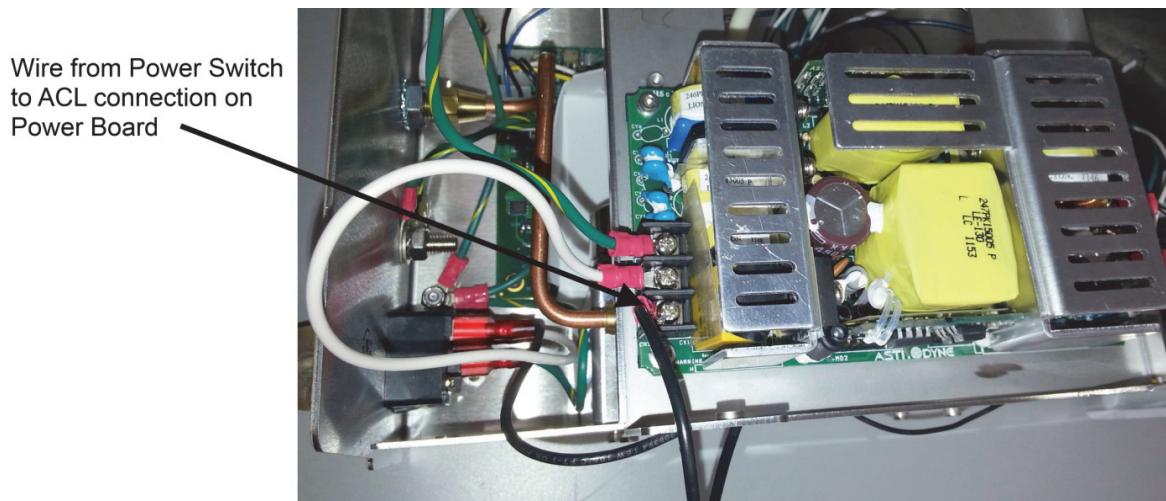
**Figure 1**

6. Remove the Power Supply Assembly screws (2 each side). See figure 2.



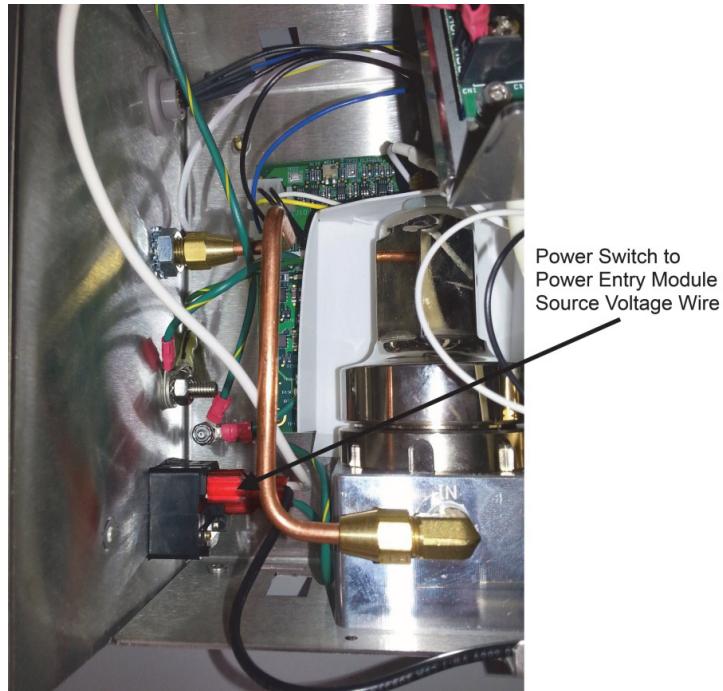
**Figure 2**

7. Turn the Power Supply Assembly over to access the connections.
8. Disconnect the black wire that routes from the power switch to the “ACL” connection on the Power Board. See figures 3.



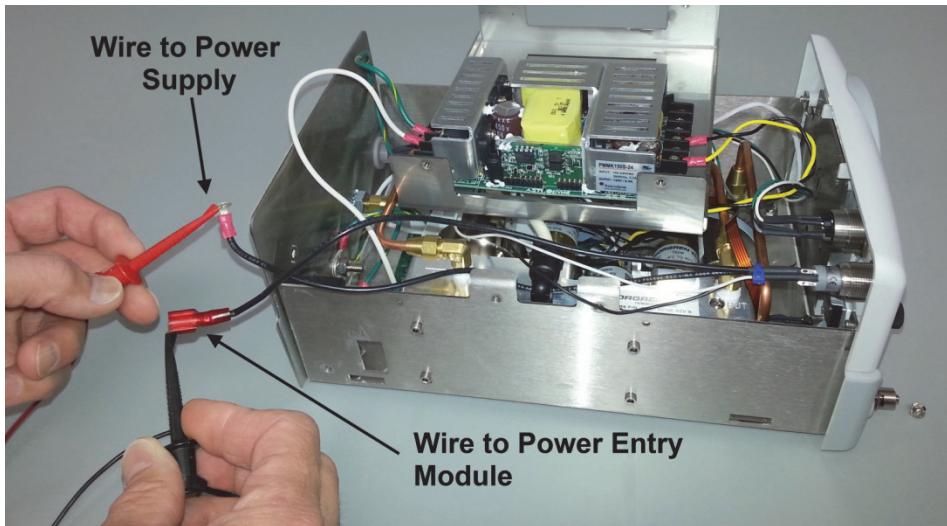
**Figure 3**

9. Then disconnect the wire that routes from Power Switch to the Power Entry Module. See figure 4.



**Figure 4**

10. Connect a DMM between the two black 115/230 VAC wires. See figure 5. Depress the Power Switch on the front of the unit. Verify that the switch latches in the ON position. An acceptable reading is less than 25 ohms. If you get a reading greater than 25 ohms replace the Power Switch.



**Figure 5**

11. Reattach the 115/230 VAC wires to the Power Supply (figure 3) and Power Entry Module (figure 4).
12. Set the Power Supply in place and secure with mounting screws (4). See figure 2.
13. Connect the machine to power and verify the correct voltage (100 VAC to 240 VAC) is present at the Power Supply input terminals. See figure 6 connections 2 and 3. If the correct voltage is not present, check the Power Entry Module and Power Cord.



**120/240 VAC present**



**Figure 6**

<b>Wire</b>	<b>Power Supply Terminal</b>
1. Ground (Green and yellow)	Ground
2. Neutral (white)	ACN
3. Hot (100 VAC to 240 VAC) (Black)	ACL
4. Ground DC (Black)	COM (Note location in figure 2)
5. +24 VDC (Yellow)	+V (Note location in figure 2)
6. Indicator LED	N/A

14. Verify the green LED is lit on the Power Supply. See figure 6 Item 6. If not, replace the Power Supply.
15. Using a DMM verify there is 24VDC at the J1 connector on the Control Board. If 24V DC is present replace the Control Board.

## **Power Switch LED is Flashing**

The flashing Power Switch LED indicates an incorrect operating voltage.

Perform the following steps in the order specified.

1. Verified the Power Switch latches in the ON position.
2. Unplug the machine from the wall outlet and check continuity of the Power Switch:
  - a. Unplug the Power Switch wire from the Power Entry Module. See "*Troubleshooting, Unit will not Power On*" Section, figure 4.
  - b. Disconnect the Power Switch wire from the Power Supply. See "*Troubleshooting, Unit will not Power On*" Section, figure 3.
  - c. Connect a DMM between the two wires. See figure 5 in "*Troubleshooting, Unit will not Power On*" Section.
  - d. Depress the Power Switch on the front of the unit. An acceptable reading is less than 25 ohms. If you get a reading greater than 25 ohms replace the Power Switch.
3. Verify the green LED on the Power Supply is lit. See "*Troubleshooting, Unit will not Power On*" Section, figure 6 item 6. If not, replace the Power Supply.
4. Using a DMM verify there is 24VDC at the P1 connector that routs from the Power Supply to the Control Board. If 24 VDC is present replace the Control Board.

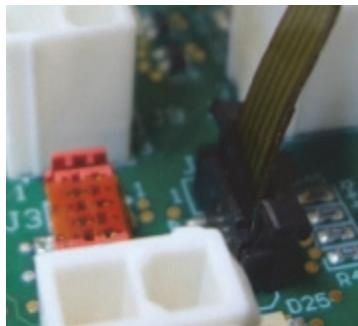
## **Water Heater switch is illuminated solid blue rather than green**

In normal operation, when the Water Heater Switch is activated, the switch should be illuminated green in color. If at any time the color changes to blue this is an indication of an error.

- Verify the Water Warmer Cable is connected to the rear of the machine. If it is plugged in, verify there is no damage to the pins.
- Replace the Water Bottle Warmer Assembly with a known good assembly, if the light turns green; replace the water bottle heater assembly.
- If the above steps do not solve the problem, replace the Control Board.

## Low/Medium/High Indicators on the Flow Control Dial will not Illuminate

- If one or more selections on the Flow Control Dial do not light up, check the connection of the CO<sub>2</sub> Flow Control Switch Ribbon Cable (J4 on the control board) to ensure it is fully inserted into the header and the latch is pressed down. See figure 1.



**Figure 1**

- If problem still persists, replace the CO<sub>2</sub> Flow Control Switch.

## Audible Internal CO<sub>2</sub> Leak Detected

- Check CO<sub>2</sub> input connection at the back of unit to ensure it is tight (no torque specified, hand-tighten using a wrench).
- Check all flare nut connections by tightening to 90 inch pounds.
- Visually inspect all copper tubing and flare nut connections for any cracks or signs of damage. If any damage or cracks are found, replace the copper tubing assembly.
- Check all fittings for tightness on the CO<sub>2</sub> Heater Assembly using a wrench. If loose, replace the CO<sub>2</sub> heater.
- With CO<sub>2</sub> pressure applied, check all components on the CO<sub>2</sub> Manifold for leaks.
- If all of the above have tested good, replace the CO<sub>2</sub> Manifold.

## Low pressure light keeps blinking

The low pressure light on the Flow Control is continuously flashing indicating that the CO<sub>2</sub> input pressure has fallen below 50 psi.

- Verify input pressure is greater than 100 psi by installing a pressure gauge in-line at the rear CO<sub>2</sub> input connection and opening the CO<sub>2</sub> supply.
- Check the pressure transducer on the control board by removing the hose from the regulator manifold connection (black push-to-connect) and applying a syringe to the open end of the tube. Squeeze the syringe to create pressure, if the LOW PRESSURE light does not turn off, the pressure transducer is defective. Replace the control board.

## Water Heater Switch LED is flickering (blue or green)

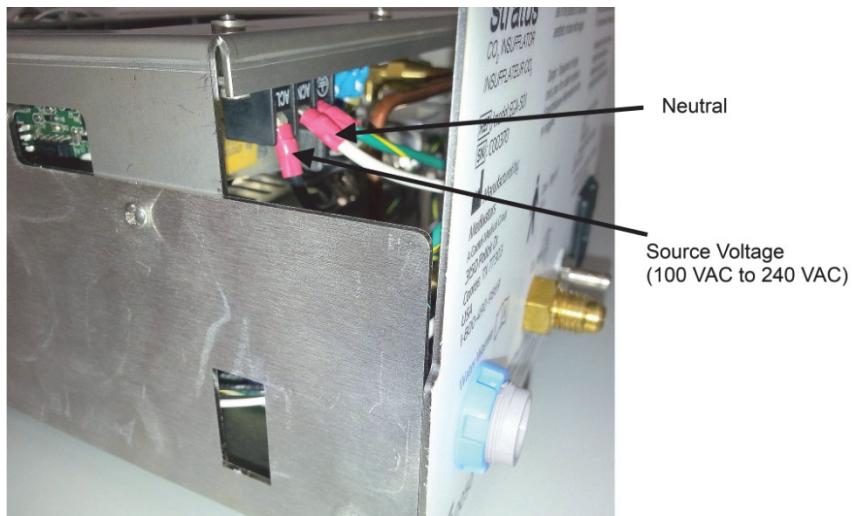
- Check the wiring on the Water Heater switch to make sure the wires are fully inserted in the white connector and the connector is fully installed in J9 on the Control Board.

## Power Supply Light is flashing



**120/240 VAC is present**

- With the unit plugged in and the Power Switch depressed to the ON position, verify that you are reading source voltage (100 VAC to 230 VAC) between the neutral (ACN) and source voltage connection (ACL) on the power supply. See figure 1.
- If the correct source voltage (100 VAC to 230 VAC) is not present check the continuity of the Power Switch (front panel). See “Troubleshooting, Unit will not Power On” Section. Replace the Power Switch if it is defective.



**Figure 1**

- Disconnect the machine from power (wall outlet) then disconnect Power Supply Cable from the J1 connector on the Control Board. Reconnect the machine to power and press the Power Switch to turn the unit back on. If Power Supply LED is still flashing, replace Power Supply.

## **CO<sub>2</sub> heater switch LED turns blue while CO<sub>2</sub> is flowing**

- Verify CO<sub>2</sub> input pressure is at least 100 PSI.



Note: The CO<sub>2</sub> Heater is designed to only function while the flow setting is on L, M or H.

- Test for the problem by running the unit on H, and if the light turns blue, replace the circuit board.

## **CO<sub>2</sub> flow is not correct according to Low/Medium/ High settings**

- Check the Flow Valves on the regulator for broken or missing wires. If wires are missing or broken, replace the CO<sub>2</sub> Manifold assembly.
- If the wiring is good, ensure the LEDs on the circuit board light up as follows:

<b>Flow Setting</b>	<b>LED illuminated</b>
L	D13
M	D12
H	D11

- If the LEDs are lighting up correctly, using a DMM ensure 12VDC exists on terminals 1-2 and 3-4 of the J5 connector with the flow on H. If not, replace the circuit board.

## **CO<sub>2</sub> temperature is not rising when CO<sub>2</sub> heater is turned on**

- Check for 24V at CO<sub>2</sub> Heater connection J8. Also verify LED D25 on Control Board is lit when the CO<sub>2</sub> heater is turned on. If not, replace Control Board.
- Check copper tubing for any leaking or broken fittings from CO<sub>2</sub> heater to output at front of unit. If any fittings are broken, replace the copper tubing assembly. If there is a connection that is loose, tighten the fitting and tighten to 90 inch pounds.

## **Water Bottle Warmer is not functioning**

- Replace the water bottle warmer

# Component Replacement

## Water Bottle Warmer Heater Replacement

### Tools Required:

- 1/4" Nut driver or wrench
- 1/16" hex wrench
- 5/64" hex wrench
- Phillips screwdriver

### Removal

1. Disconnect the unit from power (wall outlet)
2. Disconnect the Water Bottle Heater connection at the back of the EGA-501.
3. Remove Water Bottle Warmer by removing the retaining screws (4). Refer to figure 1.



**Figure 1**

4. Turn the Water Bottle Warmer over and remove the four retaining nuts and washers.
5. Remove retaining bracket.
6. Make note of orientation of defective heater. It's important to apply replacement heater in the correct orientation. See figure 2.



**Figure 2**

7. Peel off defective heater.
8. Remove old adhesive from the Water Bottle Warmer plate.

## Installation

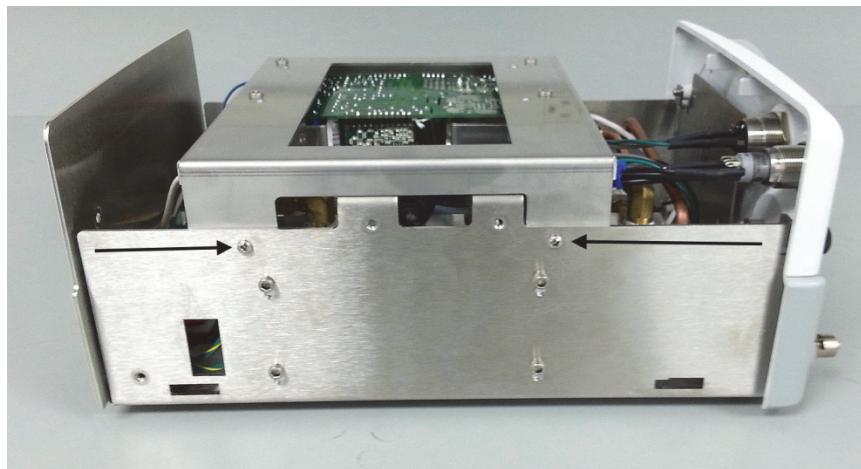
1. Remove paper backing from adhesive side of heater and attach to bottle heater plate, making note to apply in the correct orientation.
2. Attach retaining bracket and secure with the four retaining nuts and washers.
3. Connect the Water Bottle Warmer Assembly to the Tray.
4. Connect the Water Bottle Warmer to the Water Warmer on the back of the EGA-501.

## Power Supply Replacement

### Tools Required:

- Phillips Screwdriver
- 3/32 inch Hex wrench

1. Disconnect the unit from power (wall outlet).
2. Remove the cover of the unit. Refer to the cover removal instructions in “Cover Removal” Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1



**Figure 1**

4. Turn the Power Supply Assembly over to access the connections.
5. Disconnect the three AC input wires and the two DC output wires noting their location on the Power Supply. See figures 2.



**Figure 2**

Wire	Power Supply Terminal
1. Ground (Green and yellow)	Ground
2. Neutral (white)	ACN
3. Hot (100 VAC to 240 VAC) (Black)	ACL
4. Ground DC (Black)	COM (Note location in figure 2)
5. +24 VDC (Yellow)	+V (Note location in figure 2)
6. Indicator LED	N/A

6. Remove four (4) hex screws that secure the Power Supply to the mounting bracket.

 Note: Do not lose the four (4) standoffs and hex screws. They will be needed to install the new Power Supply.

7. Using the standoffs and hex screws, mount the new Power Supply to the mounting bracket. Be sure the Power Supply is orientation correctly.
8. Attach the wires as indicated in figure 2.
9. Install the mounting bracket and secure with the four (4) mounting bracket hex screws.
10. Reinstall the cover.

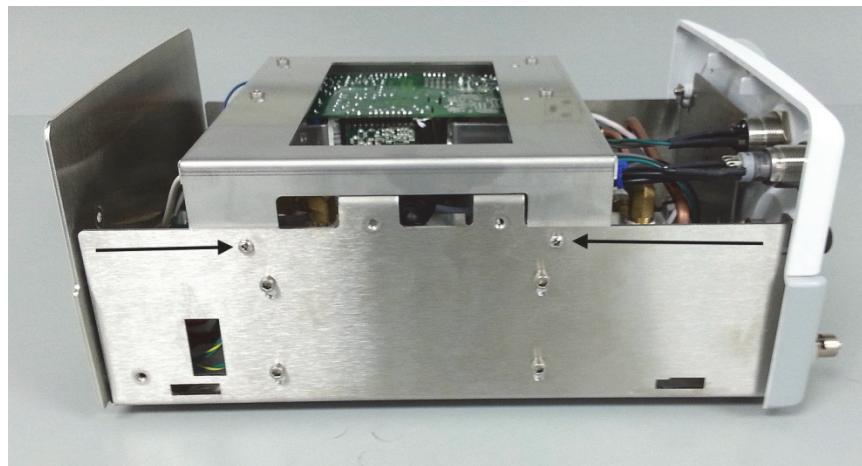
# CO<sub>2</sub> Manifold Replacement

## CO<sub>2</sub> Manifold Removal

### Tools required:

- Phillips screwdriver
- 5/64 hex wrench
- 30-120 inch pound torque wrench with a 7/16 inch attachment

1. Disconnect the unit from power (wall outlet)
2. Remove the cover as outlined in “Cover Removal” Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1



**Figure 1**

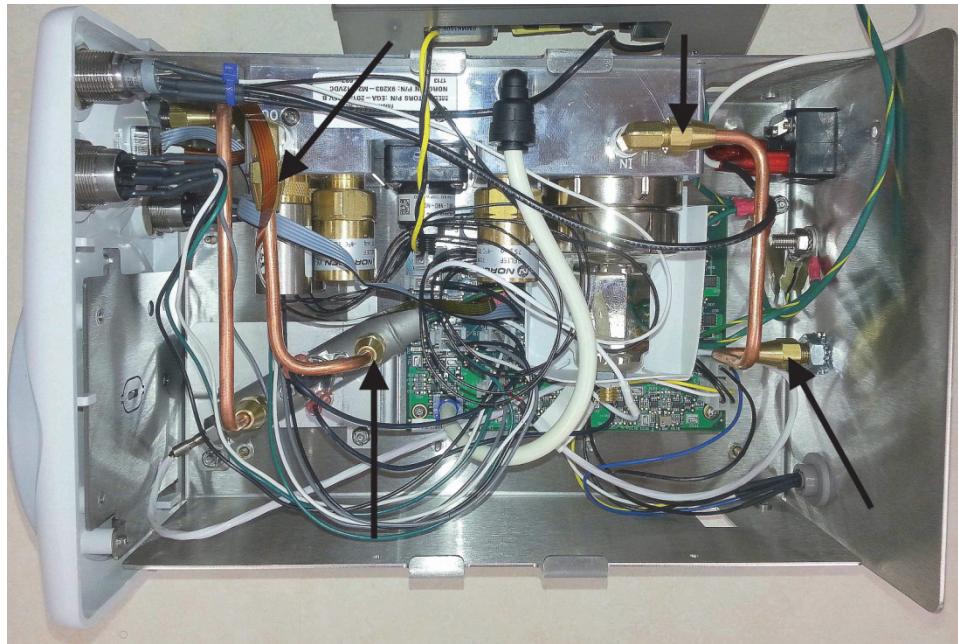
4. Lift the Power Supply Assembly from the chassis and set alongside the machine using care not to strain the wires attached to the Power Supply.
5. Remove the two (2) CO<sub>2</sub> copper tubings that attach to the Manifold. See figure 2.



**WARNING: Never supply power to the unit unless the Power Supply is properly mounted in the machine. Shock or Power Supply damage may occur.**

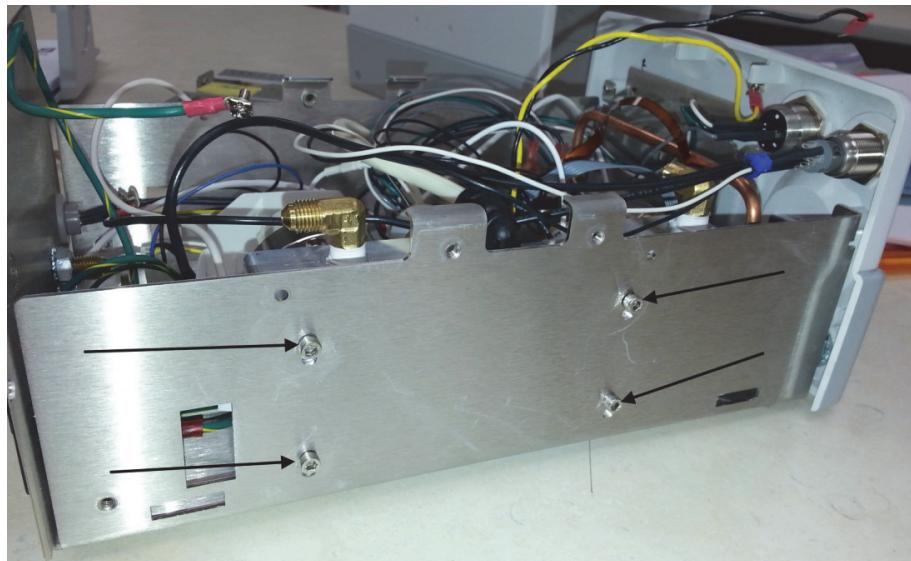


**Note:** It is recommended that you loosen the flare nuts on each end of the tubing before completely removing the flare nuts. This will reduce stress to the tubing.



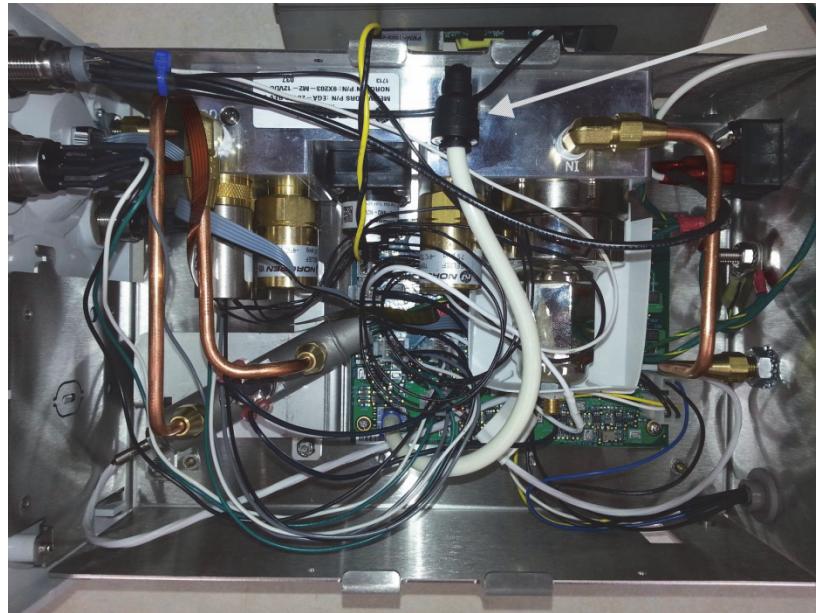
**Figure 2**

6. Remove the four hex screws that secure the Manifold to the chassis. See figure 3.



**Figure 3**

7. Remove the Pressure Sensor Tubing from the quick connect fitting on the top of the Manifold. See figure 4. You can achieve this by pressing the locking ring into the quick connect fitting while pulling the tubing from the fitting. Take care not to stress the other end of the tubing that attaches to the Pressure Sensor on the Control Board.



**Figure 4**

 Note: You will not be able to remove the CO<sub>2</sub> Flow Valve Connector from the J5 connection on the Control Board until after the manifold has been removed from the unit.

8. Carefully lift the Manifold Assembly from the machine taking care not to strain the CO<sub>2</sub> Flow Valve wires. Once the Manifold has been lifted out of the machine disconnect the CO<sub>2</sub> Flow Valve wires from the J5 connector on the Control Board and discard.

### **CO<sub>2</sub> Manifold Installation**

1. Connect the CO<sub>2</sub> Flow Valve Connector to the J5 connection on the Control Board.
2. Set the new Manifold Assembly in the chassis and secure it to the chassis with four hex head screws that were removed in Step 6. See figure 3 of the previous section.

 Note: Use the upper set of holes in the chassis (4) to mount the Manifold Assembly to the chassis.

3. Attach the two (2) CO<sub>2</sub> copper tubings to the Manifold. Thread each flare nut until snug then torque each flare nut to 90 inch pounds.
4. Insert the Pressure Transducer Tubing into the quick connect fitting on the top of the Manifold.
5. Set the Power Supply Assembly in place and secure with the four (4) screws.

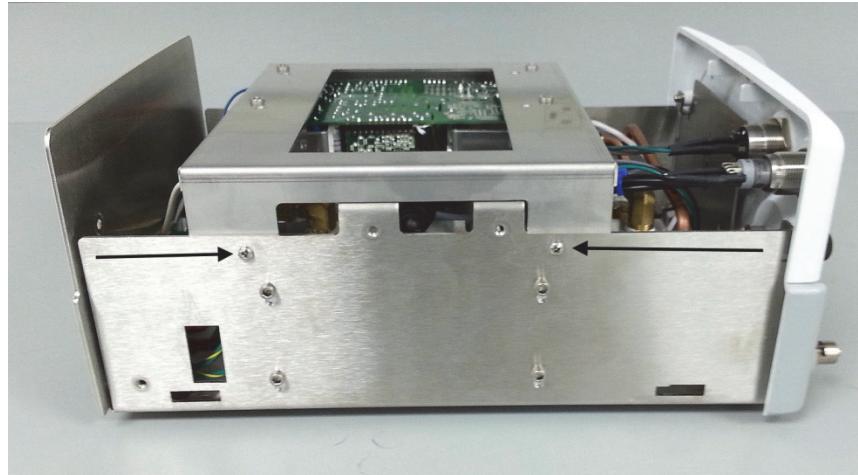
6. Connect the machine to power. Attach a female luer cap to the CO<sub>2</sub> Output on the front of the machine. Attach the CO<sub>2</sub> supply to the CO<sub>2</sub> Input on the back of the machine. Open the CO<sub>2</sub> supply valve and set the Flow Control to 'H'. This will pressurize the CO<sub>2</sub> circuit. Once the circuit has been pressurized shut off the CO<sub>2</sub> supply valve and watch the CO<sub>2</sub> supply pressure gauge (the supply pressure gauge must be located on the machine side of the shutoff). The CO<sub>2</sub> pressure cannot drop by more than 10 psi in 30 seconds. If it does there is an internal leak. The leak must be repaired before proceeding.
7. Attach the cover and secure with two (2) 5/64 hex screws.

## CO<sub>2</sub> Heater Assembly Replacement

- Tools required:
- Phillips screwdriver
- 5/64 hex wrench
- 30-120 inch pound torque wrench with a 7/16 inch attachment
- 5/16 inch nut driver
- 3/8 inch wrench

## CO<sub>2</sub> Heater Removal

1. Disconnect the unit from power (wall outlet)
2. Remove the cover as outlined in "Cover Removal" Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1.



**Figure 1**

4. Lift the Power Supply Assembly from the chassis and set alongside the machine using care not to strain the wires attached to the Power Supply.

 Note: Never supply power to the unit unless the Power Supply is properly mounted in the machine. Power Supply damage may occur.

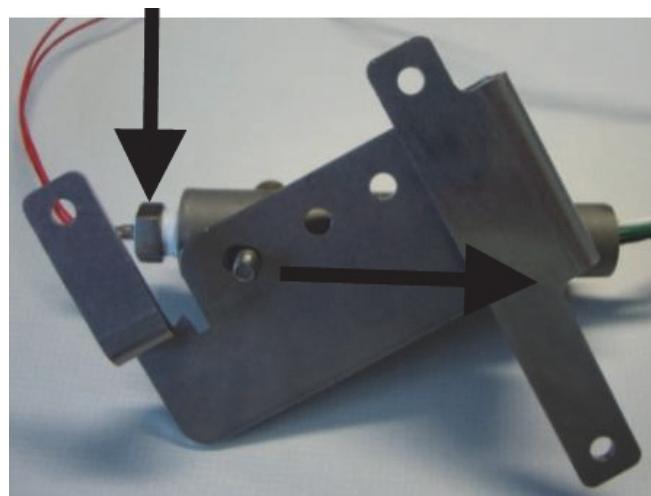
5. Remove the CO<sub>2</sub> Manifold Assembly per the CO<sub>2</sub> Manifold Removal instructions “*Component Replacement, CO<sub>2</sub> Manifold Replacement*” Section.
6. Remove the CO<sub>2</sub> Heater Tubing that routes from the output of the CO<sub>2</sub> Heater to the CO<sub>2</sub> Output Connection on the front of the machine.

 Note: It is recommended that you loosen the flare nuts on each end of the tubing before completely removing the flare nuts. This will reduce stress to the tubing and fittings.

7. Disconnect the CO<sub>2</sub> Temperature Sensor wires from the J7 connector on the Control Board.
8. Disconnect the CO<sub>2</sub> Heater wires from the J8 connection on the control board.
9. Disconnect the CO<sub>2</sub> Heater ground wire from the ground lug on the back wall of the chassis.
10. Remove the three 5/16 inch nuts that secure the CO<sub>2</sub> Heater Mounting Plate to the chassis and remove the CO<sub>2</sub> Heater Assembly from the machine.
11. Remove the two (2) 3/8 inch nuts that secure the CO<sub>2</sub> Heater to the Mounting Plate.
12. Discard the defective CO<sub>2</sub> Heater but retain the Mounting Plate.

## CO<sub>2</sub> Heater Installation

1. Install the CO<sub>2</sub> Heater to the Mounting Plate with the Temperature Sensor orientated as indicated in figure 1.
2. Slide the Heater as indicated in figure 1 and secure with two (2) 3/8 inch nuts from the “*CO<sub>2</sub> Heater Removal*” Section.



**Figure 1**

3. Secure the CO<sub>2</sub> Heater Assembly to the chassis using the three (3) 5/16 in nuts from the Heater Removal section.
4. Attach the Ground Wire to the ground lug on the back wall of the machine.

5. Connect the CO<sub>2</sub> Temperature Sensor wires to J7 on the Control Board.
6. Connect the CO<sub>2</sub> Heater wires to J8 on the Control Board.
7. Connect the CO<sub>2</sub> Heater Tubing that routes from the CO<sub>2</sub> Heater outlet to the CO<sub>2</sub> Output on the front of the machine.
8. Tighten the 7/16 inch flare nuts until snug then torque to 90 inch pounds.
9. Install the CO<sub>2</sub> Manifold Assembly per the manifold installation instructions in “*Component Replacement, CO<sub>2</sub> Manifold Replacement*” Section.
10. Set the Power Supply Assembly in place and secure with the four (4) Phillips screws from the Heater Removal procedure.
11. Connect the machine to power. Attach a female luer cap to the CO<sub>2</sub> Output on the front of the machine. Attach the CO<sub>2</sub> supply to the CO<sub>2</sub> Input on the back of the machine. Open the CO<sub>2</sub> supply valve and set the Flow Control to ‘H’. This will pressurize the CO<sub>2</sub> circuit. Once the circuit has been pressurized shut off the CO<sub>2</sub> supply valve and watch the CO<sub>2</sub> supply pressure gauge (the supply pressure gauge must be located on the machine side of the shutoff). The CO<sub>2</sub> pressure cannot drop by more than 10 psi in 30 seconds. If it does there is an internal leak. The leak must be repaired before proceeding.
12. Attach the cover and secure with two (2) 5/64 hex screws.

## **Control Board Replacement**

### **Control Board Removal**

#### **Tools required:**

- Phillips screwdriver
- 5/64 hex wrench
- 30-120 inch pound torque wrench with a 7/16 inch attachment
- Alcohol

When replacing the control board you will also need to replace the Pressure Sensor tubing.

1. Disconnect the unit from power (wall outlet)
2. Remove the cover as outlined in “*Cover Removal*” Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1.



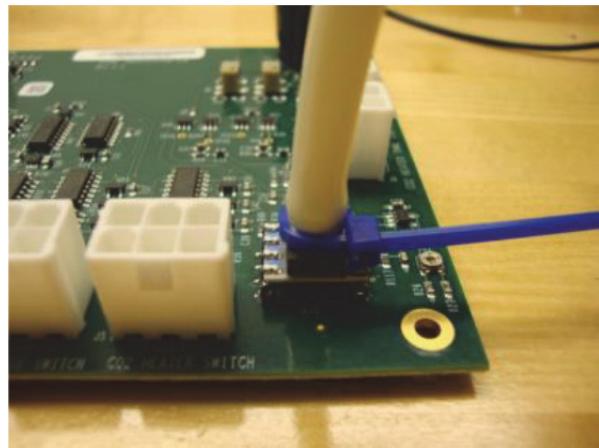
Figure 1

4. Lift the Power Supply Assembly from the chassis and set alongside the machine using care not to strain the wires attached to the Power Supply.
5. Remove the CO<sub>2</sub> Manifold Assembly per the Manifold Removal instructions in “*Component Replacement, CO<sub>2</sub> Manifold Replacement*” Section.
6. Disconnect all wiring connectors from the Control board. Mark them as needed to ensure they are attached to the correct location on the new board. You can also refer to “*Insufflator Components, Control Board*” Section, figure 1.
7. Remove the four (4) Phillips screws that secure the Control Board to the chassis and remove the board from the machine.

## Control Board Installation

 Note: When handling the Control Board be sure to take proper ESD precautions to ensure the board isn't damaged.

1. Lubricate the inside of the Pressure Sensor Tubing with alcohol. This will allow for easier connection to the Pressure Sensor.
2. Before the alcohol dries, install the tubing by using a twisting action while pressing the tubing onto the pressure sensor. Use care as the pressure sensor is fragile.
3. Install a zip tie to the pressure sensor, figure 1. Use a zip tie gun to secure and trim it. Ensure the zip tie is below the barb of the pressure sensor. Use the zip tie gun with care, making sure to allow the gun to only contact the sensor and not put excess strain on the sensor.



**Figure 1**

4. Use the four (4) screws from the Control Board removal section to mount the board to the standoffs on the chassis. The pressure sensor must be facing toward the front of the unit.
5. Install the CO<sub>2</sub> Manifold Assembly per the manifold installation instructions in in “*Component Replacement, CO<sub>2</sub> Manifold Replacement*” Section.
6. Set the Power Supply Assembly in place and secure with the four (4) Phillips screws.
7. Connect the machine to power. Attach a female luer cap to the CO<sub>2</sub> Output on the front of the machine. Attach the CO<sub>2</sub> supply to the CO<sub>2</sub> Input on the back of the machine. Open the CO<sub>2</sub> supply valve and set the Flow Control to ‘H’. This will pressurize the CO<sub>2</sub> circuit. Once the circuit has been pressurized shut off the CO<sub>2</sub> supply valve and watch the CO<sub>2</sub> supply pressure gauge (the supply pressure gauge must be located on the machine side of the shutoff). The CO<sub>2</sub> pressure cannot drop by more than 10 psi in 30 seconds. If it does there is an internal leak. The leak must be repaired before proceeding.
8. Attach the cover and secure with two (2) 5/64 hex screws.

## **Power Switch Replacement**

### **Power Switch Removal**

Always replace the Power Switch Boot when replacing the Power Switch.

#### **Tools required:**

- Phillips screwdriver
- 5/64 hex wrench
- 7/8 inch wrench

1. Disconnect the unit from power (wall outlet)
2. Remove the cover as outlined in “*Cover Removal*” Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1.



**Figure 1**

4. Lift the Power Supply Assembly from the chassis and set alongside the machine using care not to strain the wires attached to the Power Supply.
5. Unplug the wire that routes from the Power Switch to the Power Entry Module.
6. Remove the wire that routes from the Power Switch to the ACL connection on the Power Supply.
7. Remove the Power Switch LED connector from the J2 connector on the Control Board.
8. Use a 7/8 inch wrench to remove the mounting nut that secures the Power Switch to the chassis.
9. Remove the Power Switch Assembly and nut from the machine.

## **Power Switch Installation**

1. Insert the power wires and the LED connector through the Power Switch opening in the front of the chassis and through the mounting nut.
2. Thread the mounting nut onto the Power Switch and use a 7/8 inch wrench to tighten securely.
3. Connect the power wire with the spade connection to the top connector on the Power Entry Module.
4. Connect the power wire with the ring terminal to the ACL connector on the Power Supply.
5. Connect the LED connector to the J2 connection on the Control Board.
6. Set the Power Supply Assembly in place and secure with the four (4) Phillips screws.
7. Attach the cover and secure with two (2) 5/64 hex screws.

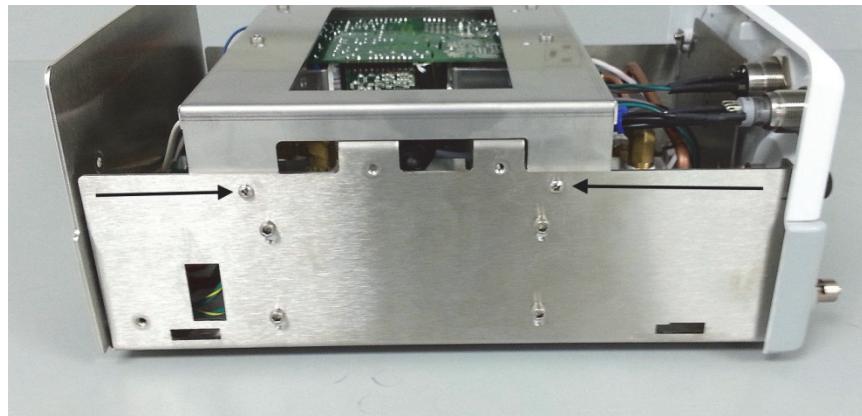
# **CO<sub>2</sub> Heater Switch Replacement**

## **CO<sub>2</sub> Heater Switch Removal**

### **Tools required:**

- Phillips screwdriver
- 5/64 hex wrench
- 7/8 inch wrench

1. Disconnect the unit from power (wall outlet)
2. Remove the cover as outlined in “Cover Removal” Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1.



**Figure 1**

4. Lift the Power Supply Assembly from the chassis and set alongside the machine using care not to strain the wires attached to the Power Supply.
5. Remove the J6 connector from the Control Board.
6. Use a 7/8 inch wrench to remove the mounting nut that secures the CO<sub>2</sub> Heater Switch to the chassis.
7. Remove the CO<sub>2</sub> Heater Switch Assembly from the machine.

## **CO<sub>2</sub> Heater Switch installation**

1. Insert the wires from the CO<sub>2</sub> Heater Switch through the opening in the front of the chassis and the mounting nut.
2. Secure the CO<sub>2</sub> Heater Switch to the front wall by using a 7/8 inch wrench to tighten the mounting nut.
3. Connect the wires from the CO<sub>2</sub> Heater Switch to the J6 connector on the Control Board.
4. Set the Power Supply Assembly in place and secure with the four (4) Phillips screws.
5. Attach the cover and secure with two (2) 5/64 hex screws.

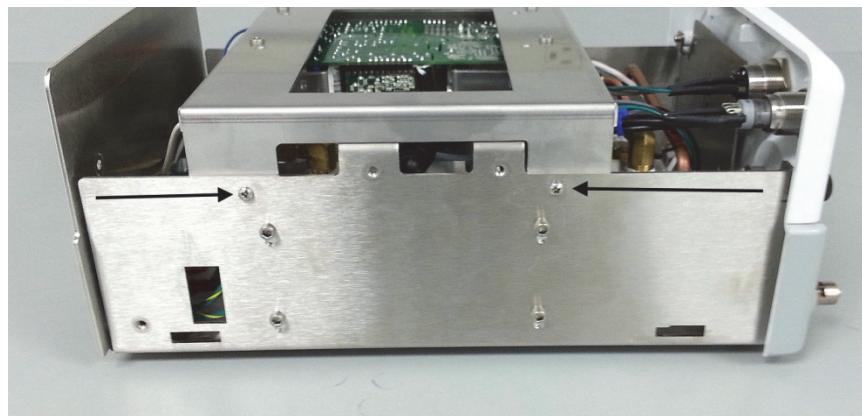
# Flow Control Assembly Replacement

## Flow Control Assembly Removal

### Tools required:

- Phillips screwdriver
- 5/64 hex wrench
- 7/16 wrench
- Pliers
- .050 gap gauge

1. Disconnect the unit from power (wall outlet)
2. Remove the cover as outlined in “*Insufflator Components*” Section.
3. Remove the Power Supply Assembly screws (2 each side). See figure 1.

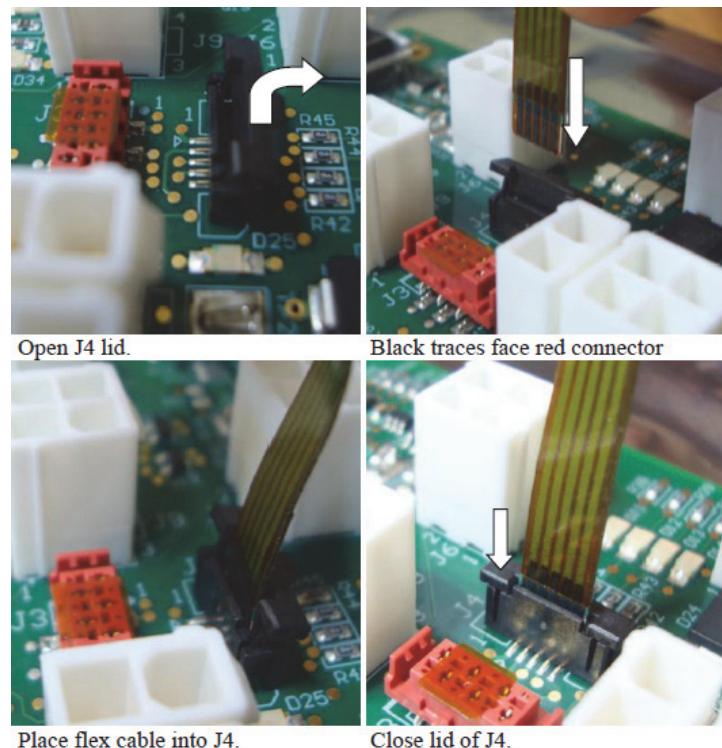


**Figure 1**

4. Lift the Power Supply Assembly from the chassis and set alongside the machine using care not to strain the wires attached to the Power Supply.
5. Use the 5/64 hex wrench to loosen the set screws on the Flow Control Assembly Knob and then remove the knob.
6. Using a 7/16 inch wrench remove the Rotary Encoder nut.
7. Slide the Rotary Encoder into the machine and disconnect the ribbon cable from the J3 connection on the board. See figure 2.
8. Disconnect the Flow Control Indicator ribbon cable from the J4 connection on the control board. See figure 2.
9. Remove the Flow Control Indicator from the machine and discard.

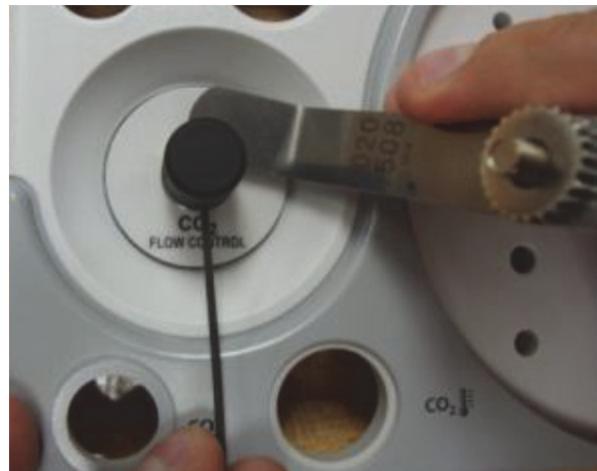
## Flow Control Assembly Installation

1. Insert that Flow Control Indicator Ribbon Cable through the opening in the chassis.
2. Insert the Rotary Encoder through the opening in the front wall and through the Flow Control Indicator.
3. Secure the Rotary Encoder and Flow Control Indicator to the front wall with the nut and tighten until snug with a 7/16 in wrench.
4. Attach the Rotary Encoder Ribbon Cable to J3 on the control board. See figure 2.
5. Attach the Flow Control Indicator Ribbon Cable to the J4 connection on the control board. See figure 2.



**Figure 2**

6. Attach the Knob to the Rotary Encoder Shaft. While holding the .050 gap gauge between the Nut and Knob and secure the two 5/64 set screws. See figure 3.



**Figure 3**

7. Set the Power Supply Assembly in place and secure with the four (4) Phillips screws.
8. Attach the cover and secure with two (2) 5/64 hex screws.

## **Carbon Dioxide (CO<sub>2</sub>) Tank Basics**

1. Use only U.S.P medical grade CO<sub>2</sub>.
2. Only size "D" or "E" tanks are allowed. Refer to your local gas supplier for size and capacity details.
3. Read and understand all warnings that come with your commercially available tanks.
4. The tank must remain in an upright position when attached to the Insufflator to avoid damage to the internal regulator of the Insufflator.
5. Keep CO<sub>2</sub> tank away from any heat source.

## Parts List

Part Number	Description
EGA-1015	Fuses 250V 1OA
EGA-1023	Power Supply
EGA-1035	Rotary Encoder
EGA-1045	Control Board
EGA-2013	CO <sub>2</sub> Manifold
EGA-2044	Tube, Input, Copper, HP
EGA-2045	Tube, Copper, Low Pressure
EGA-2051	Tube, Copper, Output
EGA-4019	Indicator, CO <sub>2</sub> Flow
EGA-4024	Heater, CO <sub>2</sub>
EGA-4025	Heater Switch Assembly

## Disposal

No special care is needed when disposing of the device.



# **Limited Warranty**

## **Limited Warranty**

Subject to the terms below, MEDIVATORS Inc. (the "Company") warrants that its products (the "Products") will conform to the Company's written specifications (where applicable) and will be free from defects in material and workmanship under normal use and service for the following periods (the "Warranty Period"):

**Endoscope reprocessors and associated equipment, and Irrigation Pumps:** fifteen (15) months from date of shipment from the Company or one (1) year from the date of installation, whichever occurs first.

**Consumables, accessories, and Product service parts**, including, but not limited to, endoscope hook-ups, filters, printers, printer supplies, test strips, accessory bags, and service parts for products: ninety (90) days from the date of installation or one hundred and twenty (120) days from the date of shipment, whichever occurs first.

**Disposable Products:** warranted for single use. The Warranty Period will not in any case exceed the expiration date on the Product label.

The warranty does not cover, and the Company will have no warranty obligation whatsoever with respect to, any damage to a Product caused by or associated with: (i) external causes, including without limitation, accident, vandalism, acts-of-God, power failure or electric power surges, (ii) abuse, misuse or neglect of the Product by the customer or use of unauthorized third party filters or other consumables and accessories, (iii) usage not in accordance with product instructions, (iv) the customer's failure to perform required preventive maintenance, or (v) servicing or repair not authorized by the Company.

## **Limitation of Remedy**

The warranty obligation of the Company hereunder is limited to (at its option) (i) the repair or replacement of the defective Products or any parts it deems defective, or (ii) a refund of the purchase price. This will be customer's exclusive remedy for a covered defect.

In order to recover under the warranty, the customer must notify the Company in the state (if in the U.S.A.) or the country of installation, of the defect (describing the problem in reasonable detail) prior to the expiration of the Warranty Period and within thirty (30) days of discovery of the defect. Upon receiving the Company's official "Returned Material Authorization" (RMA), the customer must promptly return the defective part or Product to the Company (or the service center indicated on the RMA), freight and insurance prepaid. The Company will not be responsible for any damage during shipment.

## **Warranty Disclaimer**

THE WARRANTY ABOVE IS THE COMPANY'S ENTIRE WARRANTY OBLIGATION TO THE PURCHASER OF PRODUCTS. IT IS IN LIEU OF ALL OTHER WARRANTIES OF THE COMPANY, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND THE COMPANY DOES NOT REPRESENT OR WARRANT THAT ANY PRODUCT WILL MEET CUSTOMER'S REQUIREMENTS. THE COMPANY'S RESPONSIBILITY FOR DEFECTS IN A PRODUCT IS LIMITED SOLELY TO REPAIR, REPLACEMENT OR REFUND OF THE PURCHASE PRICE AS SET FORTH IN THIS WARRANTY STATEMENT.

TO THE EXTENT PERMITTED BY LAW, THE COMPANY SHALL NOT, UNDER ANY CIRCUMSTANCES, BE LIABLE TO CUSTOMER FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT, PUNITIVE OR SPECIAL DAMAGES OR LOSSES, INCLUDING WITHOUT LIMITATION, DAMAGES ARISING OUT OF OR IN CONNECTION WITH ANY MALFUNCTIONS, DELAYS, LOSS OF PROFIT, INTERRUPTION OF SERVICE, OR LOSS OF BUSINESS OR ANTICIPATORY PROFITS, EVEN IF THE COMPANY HAS BEEN APPRISED OF THE LIKELIHOOD OF SUCH DAMAGES OCCURRING.

This Warranty gives the customer of Products specific legal rights, and customers may also have other rights which vary from jurisdiction to jurisdiction.

In no event shall the Company's liability exceed the original purchase price of the covered Product.

No representative or agent of the Company has any authority to bind the Company to any other representation or warranty with respect to the Products, and the customer accepts the Products subject to all of the terms above.





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